



University of Southern California Sea Grant

Strategic Plan

2018 - 2021

The
Urban Ocean
Program





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Malibu Lagoon during a king tide.

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Redondo Beach pier during a king tide.

About USC Sea Grant

U.S. Congress created Sea Grant in 1966 as a federal and state partnership to help fund and coordinate the intellectual capacity of the nation's universities to solve ocean, coastal, and Great Lakes problems. Today, Sea Grant is a national network comprised of 33 university-based programs in coastal and Great Lakes states. Sea Grant is administered and supported by the National Oceanic and Atmospheric Administration (NOAA). It is implemented by leading research universities and represents a unique partnership among states, the federal government and academic institutions. Sea Grant programs provide scientific expertise and new discoveries that foster the wise use and conservation of the nation's coastal, marine and aquatic resources.

The Sea Grant Program at the University of Southern California (USC) in Los Angeles, California, is unique among the 33 state programs in the national Sea Grant network. It is among the smallest, with an annual federal budget of approximately \$1 million. USC is one of the largest private universities in the United States and was an early participant in the National Sea Grant College Program, establishing its Sea Grant program 44 years ago. USC has conducted marine science research and managed established marine laboratories in Southern California for over one hundred years. USC's marine facilities, research programs, marine faculty, and marine and environmental curricula make it one of the major research Universities in the Los Angeles region for ocean studies.

Despite a relatively small budget and staff compared to other Sea Grant programs, USC Sea Grant serves one of the largest (nearly 17 million) and diverse populations in three coastal counties of Southern California (Orange, Los Angeles, and Ventura) and two adjacent inland counties (San Bernardino and Riverside).

Los Angeles County is the most populous and diverse county in the United States, with 10 million residents speaking over 140 languages, making this a prime region to study the effects of urbanization on our coastlines and the impact of the ocean on the urbanized environment. This is especially true in the Southern California culture of "endless summer," that places such a unique value on its beaches and coastal ocean. Recreational environmental amenities draw over 4 billion dollars in international tourism to the Los Angeles area each year. Los Angeles County is home to the busiest port complex in the United States; close to 45% of all oceanic freight entering the country comes ashore through the twin ports at Los Angeles and Long Beach. Together, these ports contribute more than 1 million jobs to a vibrant economy.

Over the years, USC Sea Grant has established a network of scientists, government agency personnel, private and public sector advisors, and science education leaders. Because of its extensive outreach to partners, collaborators, resource managers and the public, USC Sea Grant can anticipate research needs and develop responses in a timely and responsive manner, leveraging its collaborations for broader impacts.

Vision & Mission

USC Sea Grant contributes to solving the problems of the Urban Ocean, while recognizing the opportunities for coastal commerce, recreation, and improving the quality of life in coastal regions such as Southern California. USC Sea Grant solicits and funds relevant, innovative research to help find solutions for pressing coastal management problems that demand science to help resolve issues of the greatest ecological and social importance. USC Sea Grant fosters the public's understanding of the science, so that it motivates better decisions and continues to bring decision makers, scientists and the public together to find solutions that are informed by the best available science, accessible and understood by all, and supported by local communities.

Core Values

These core values reflect USC Sea Grant's core strengths and experience, and guide its management and decision-making:

- USC Sea Grant is dedicated to its role as a neutral broker of science that serves the people, ecosystems, and wildlife of such a diverse region.
- USC Sea Grant upholds the highest standards of scientific integrity.
- USC Sea Grant is dedicated to its role building capacity and connections across people, resources, and knowledge to solve our most pressing problems.
- USC Sea Grant functions as a boundary organization that bridges the gap between science, stakeholders, and policy to support better decisions.
- USC Sea Grant leverages partnerships and collaborations with diverse stakeholders for broader impacts.
- USC Sea Grant is a leader and regional resource for scientific, policy and educational marine and coastal information.
- USC Sea Grant focuses its research, outreach and education programs on the most pressing issues affecting the urban coastline.
- USC Sea Grant is responsive to local, regional, state, and national research needs and develops responses in a timely manner.



Barnacle.

Cross-cutting Principles

USC Sea Grant aligns its cross-cutting principles with those of the National Sea Grant College Program. In the course of implementing the 2018-2021 National Strategic Plan, the National Sea Grant College Program will strive to address two specific areas to enhance the Program's capabilities in order to meet national needs:

- Cultivate Partnerships by integrating the expertise and capabilities of partners from the international, federal, tribal, and state communities and from academia, nongovernmental organizations, and industry.
- Enhance Diversity and Inclusion by seeking and welcoming diverse perspectives in order to enhance cultural understanding and enable the network to pursue its vision and mission effectively and efficiently.



Lechuza Beach in Malibu.

Introduction

A journey down California's 1,100-mile coastline reveals rocky seashores, sandy beaches, and dramatic cliffs that are home to diverse plants, seabirds, and a wide variety of marine life. Offshore islands provide a lens into the history of the California coast and provide protected habitats for both terrestrial and marine species. One can also see super highways, power plants, concrete river channels, trash, poor water quality, and two of the busiest ports in the United States. USC's location in the middle of Los Angeles has made the Sea Grant Program here an important regional resource, concentrating on issues arising out of the necessity of managing people and natural resources in an intensely populated and developed coastline. For this reason, in the 1980s, the USC Sea Grant program adopted as its programmatic focus the "Urban Ocean," a theme that continues to characterize our perspective on the needs of this region.

USC Sea Grant's strategic plan goals for 2018-2021 reflect America's most urgent coastal and ocean needs, NOAA's national priorities, and the National Sea Grant Program's goals, while still addressing the specific needs and priorities of the region and the state. Under the larger umbrella of the urban ocean theme, our program's focus areas are congruent with the National Sea Grant College Program Strategic Plan for 2018-2021 (henceforth referred to as the National Plan) and include: Healthy Coastal Ecosystems; Sustainable Fisheries and Aquaculture; Resilient Communities and Economies; and Environmental Literacy and Workforce Development.



Santa Monica beach.

40 Years of Progress in the Urban Ocean

The USC Sea Grant Program has grown throughout the years to provide expert guidance, funding, coordination, facilitation, training, education, neutral brokerage and mediation - all under the common goal of elevating the best available science to support better decisions. For the last 44 years, our research investments, education programs and extension efforts have supported achievements in several key areas of importance including water quality, harmful algal blooms, toxicology, aquatic invasive species, marine wildlife and ecosystems, ports, marine transportation, coastal management, coastal community resilience, sea level rise, and advances in "K-grey" marine science education. As we look towards the future we are excited at the array of new ideas, research opportunities, and potential new partners who will help us build sustained, long-term progress for our urban ocean and its residents.

The problems found in Southern California are not unique to the region, which is evident by the growing use of the term "urban" in titles for marine and coastal organizations and programs across the country. In addressing the range of issues found here, we will continue to provide information and models serving other urban coastal regions in California, such as the San Francisco Bay and San Diego regions, and other urban coastal environments in the United States and around the world. We consider Los Angeles a city of the future and treat it as an urban ocean laboratory. More than any other location in the country, USC Sea Grant can pioneer research and solutions for issues that will only become more common along the steadily developing coastlines of the United States and the world.

Leadership

USC Sea Grant is administered within the USC Wrigley Institute for Environmental Studies (WIES). WEIS is an “organized research unit” which administers the Wrigley Marine Science Center on Catalina Island, a world-class marine laboratory and conference facility. The laboratory hosts research and education programs in fisheries and aquaculture, aquaponics, geobiology, and climate change research as well as innovative programs for “K-grey” marine science education, as well as undergraduate and graduate programs in the marine sciences. The laboratory and conference center serve not only USC, but are open to the broader marine and ocean science community. Sea Grant serves as a major research component of WIES; often Sea Grant funded research is conducted at the Catalina facility. A graduate fellowship program is open to all applicants who have a need to conduct their research on Catalina Island and the fellows participate in the K-grey and other educational and research programs.

WIES is part of the Dana and David Dornsife College of Letters, Arts and Sciences (Dornsife College). Dornsife College is the largest administrative unit at USC and the heart of teaching and research in the Natural Sciences, Humanities, and Social Sciences. The present reporting line from Sea Grant runs from Linda Duguay (Sea Grant Director and Director of Research for WIES); to Dr. John Heidelberg, Interim Director of WIES; to Dr. Amber Miller, Dean of the Dornsife College; to Dr. Michael Quick, Provost and Senior Vice President for Academic Affairs; to USC President Dr. C. L. Max Nikias.

This location and reporting structure is advantageous for USC Sea Grant for several reasons. First, it is housed in the same university revenue center as most of the academic departments and principal investigators likely to apply for USC Sea Grant support. Second, the close affiliation with WIES provides a symbiotic relationship, providing a solid focus for research, marine science, policy, and education and outreach programs. Furthermore, this close relationship easily allows for collaborative efforts with WIES, such as position sharing and joint research and education efforts.



Wrigley Institute on Catalina Island.

In 2015, USC Sea Grant and the Wrigley Institute were co-located in new offices on the main USC University Park campus. In 2016, the Environmental Studies program was also located in the same building. The close proximity on campus of the marine environmental studies research and teaching programs allows for enhanced opportunities for collaboration and student participation.

The USC Sea Grant Program has a clear advantage in having its Director also play an important role in WIES leadership. Because USC Sea Grant is a major research arm of WIES, the Director helps to insure that results from USC Sea Grant-funded research and outreach are well represented in WIES' reports to its Advisory Board and supporters. Since its formation in 1996, the Wrigley Institute actively participates to recruit new faculty in various sub-disciplines of marine sciences, particularly in marine environmental biology, geobiology, environmental, and earth sciences. In addition, the Wrigley Institute endows new fellowships for graduate students, runs and NSF supported REU - Research Experiences for Undergraduates - programs (10 week residential program on Catalina), and supports new “K-grey” education programs. The growing cadre of marine scientists fostered by WIES - and a strong institutional commitment to marine sciences - allows USC Sea Grant to foster the work of an expanding group of excellent faculty researchers and students in the pursuit of solutions to local and regional urban ocean problems.

As part of a large research university, we recognize the need for information security going forward, in line with NOAA's Information Technology Security program. USC's information technology infrastructure is protected by an extensive range of cyber and information security protocols, and training is required for all USC faculty and students.

Sea Grant's small staff size allows close cohesion of the range of program elements and an invaluable cross-fertilization of ideas, plans and programming. Research administration, planning, extension, education, and communications efforts combine seamlessly to provide Southern California, state and national constituencies with information and services that are naturally interdisciplinary and coordinated.



Shark research at Catalina Island.



Erosion in Malibu from winter storms.

Strategic Plan Development

USC Sea Grant developed this Strategic Plan in 2016, relying on input from the range of interests and stakeholders at the national, regional, state and local levels. We surveyed members of our Advisory Council, Academic Coordinators and the California Natural Resources Agency Sea Grant Advisory Panel (RASGAP), as well as influential stakeholders in the region. Stakeholders included individuals from local and state governments, marine transportation and ports, K-12 and higher education professionals, coastal businesses, university researchers, native peoples, commercial fisheries (including aquaculture), nonprofit environmental organizations, coastal residents, and communications professionals. Survey responses confirmed that USC Sea Grant's strategic focus areas, program areas, and research priorities are on point and valuable to the region. There was enthusiasm for expanding focus on the connections between freshwater systems, i.e. watersheds, aquifers, etc., and ocean and coastal waterways (see Healthy Coastal Ecosystems section). Survey responses also confirmed the interlinking benefits of USC Sea Grant's programs and outreach efforts across the region. 100% of respondents stated that they had increased knowledge or awareness of ocean and coastal issues as a result of Sea Grant outreach and education programs. A majority of respondents also stated that they gained useful contacts or new partnerships through working with USC Sea Grant, and had increased access to technical assistance, educational resources, and new scientific or management information and tools.

The USC Sea Grant Strategic Plan for 2018-2021 is broad in scope and vision, but with recognition of the constraints imposed by the modest character of our resources. We thus continue to prioritize the elements of our research, extension and education portfolio in order to focus on the most pressing concerns of the greater urban Southern California region.

National Perspectives

The National Plan for 2018-2021 states as its mission “to provide integrated research, communication, education, extension and legal programs to coastal communities that lead to the responsible use of the nation’s ocean, coastal and Great Lakes resources through informed personal, policy and management decisions.” This follows closely upon the broad goal of the NOAA to “foster healthy and sustainable marine resources, habitats, and ecosystems through improved management and partnerships.” Our intent is to contribute to implementing the twin visions in the context of the Urban Ocean environment of Southern California.

The National Plan was developed with input from the state Sea Grant programs, national stakeholder groups, and representatives from NOAA programs, other federal agencies, and nonprofit environmental organizations. The National Plan thus provides the primary context for USC Sea Grant’s plan. For the suite of challenges presented in the Southern California urban coastal region, the USC Sea Grant plan refocuses those priorities, continuing our major emphasis on water quality, coastal ecosystem health, coastal community resilience, and a robust education effort. As part of our resilient communities and economies emphasis, we continue work on changing coastal communities, land use planning and marine transportation and ports, which are particularly important as economic drivers in the Southern California metropolitan region.

We have aligned USC Sea Grant’s major focus areas with the National Plan focus areas, including: Healthy Coastal Ecosystems; Sustainable Fisheries and Aquacultures; Resilient Communities and Economies; and Environmental Literacy and Workforce Development. Our plan was developed based on input from the diverse constituencies with whom we work, along with formal input from our Advisory Council, Academic Coordinators, and RASGAP.

Each focus area has goals, outcomes, and performance measures. The goals describe the desired long-term direction for each focus area. The outcomes are benchmarks from which USC Sea Grant can track progress toward achieving each goal. Performance measures are quantitative ways of measuring outcomes. Overall, USC Sea Grant has aligned the goals, outcomes and performance measures for its 2018-2021 strategic plan with the goals, outcomes and performance measures of the National Plan.



Sea star.

State and Local Perspectives

At the local level, several advisory bodies to Sea Grant are regularly consulted for guidance and strategic planning advice. These are councils on academic research, local, state and regional research and outreach needs, and educational initiatives. All were consulted in the development of this Strategic Plan and regularly contribute ideas and insight to USC Sea Grant.

USC Sea Grant has an active, diverse, and engaged Advisory Council (Appendix I). Membership of the Council is comprised of representatives of public and quasi-public agencies and non-governmental organizations (NGOs) with an interest or stake in Sea Grant’s research, outreach or education programs. Advisors represent the City and County of Los Angeles, the California Water Resources Control Board, the California Coastal Commission, the Bay Restoration Commission (part of the EPA National Estuary Program), the Southern California Coastal Water Research Project, public universities, private industry, and others. USC

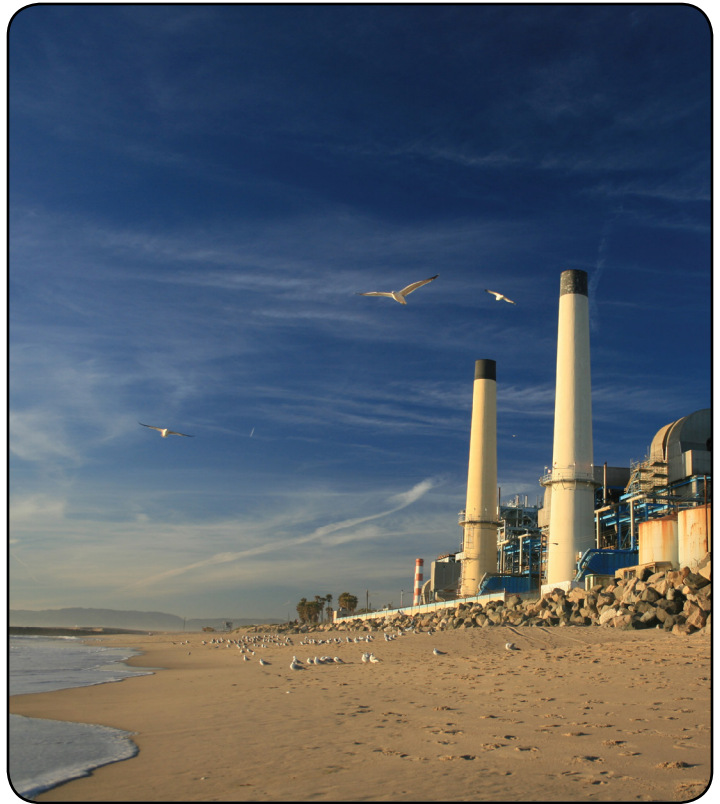
Sea Grant keeps the Council informed about research and outreach progress and consults with members formally on an annual basis. Advisory Council members advise planning and requests for proposal development and often review project proposals in their areas of expertise. Sea Grant staff call upon them informally for program advice on new and existing initiatives, maintaining an ongoing dialogue between the Council and staff year-long, not just through the annual in-person meeting.

Advisors formally reviewed and contributed to this Strategic Plan at its 2016 annual meeting. The dialogue and input from the Advisory Council are vital to the success and relevancy of USC Sea Grant's work. The diverse composition of the Advisory Council is analogous to the diversity of the region USC Sea Grant serves. Purposefully, this positions USC Sea Grant's advisors to aid in balancing the focus of our work on issues that require the most immediate need and those that require long-term commitment.

USC Sea Grant's Academic Coordinators (Appendix II) come from several academic departments at USC, helping to ensure that a range of scientific disciplines is represented. A former Director of the Southern California Marine Institute—a consortium of USC, UCLA, California State University campuses in Southern California, and Occidental College—also serves on this committee. The Academic Coordinating Committee contributes to the development of Sea Grant's Strategic Plan and research solicitations, reviews preliminary proposals and provides input on external research opportunities and other programs.

A third advisory group, the Resources Agency Sea Grant Advisory Panel (RASGAP), is a state panel comprised of representatives from the Departments and Programs within the California Natural Resources Agency, the state agency that provides state matching funds for the two Sea Grant programs in California (Appendix III). The RASGAP panel meets with Sea Grant Directors and Associate Directors twice a year during those years when proposals are being considered – first, for review and ranking of preliminary proposals, and second, after peer and technical reviews have been conducted – to help rank projects in the context of Agency information needs. In years when proposals are not being reviewed, Sea Grant consults members of RASGAP for guidance on emerging state priorities. This open dialogue and collaboration between key state partners and USC Sea Grant helps to calibrate research focus areas. As management needs shift gradually or events occur that require a rapid response, it is crucial to both state agencies and scientist to work cooperatively. In this capacity, USC Sea Grant leverages resources, such as staff time and professional networks, in an effort to support our key focus areas.

The California Ocean Protection Council (OPC) was created in 2004 to ensure that California maintains healthy, resilient, and productive ocean and coastal ecosystems for the benefit of current and future generations. The Governor-appointed council is charged with providing leadership and coordinating the activities of ocean-related state agencies to better manage ocean resources. The OPC guides California's ocean policy initiatives and provides input for Sea Grant's solicitation of research proposals as well as occasional funding for Sea Grant projects. Sea Grant staff often attend meetings of the OPC in order to stay abreast of new policy directions and to obtain input on the research and outreach Sea Grant can contribute to state



El Porto power plant near El Segundo.



Kelp forest. Photo: Tom Ford

management programs. In the OPC's FY2012-2017 Strategic Plan, there are five areas of focus: science-based decision-making; climate change; sustainable fisheries and marine ecosystems; coastal and ocean impacts from land-based sources; and existing and emerging ocean uses. These focus areas overlap with USC Sea Grant's focus areas in this Strategic Plan. Additionally, OPC staff oversees the administration of RASGAP, reinforcing active collaboration among USC Sea Grant and high level State representatives.

USC Sea Grant also maintains close contact with the California Ocean Science Trust (OST), a nonprofit public benefit corporation established pursuant to the California Ocean Resources Stewardship Act of 2000. OST's mission is "to ensure that the best available science is applied to California's policies and ocean management to successfully maintain a healthy, resilient, and productive ocean and coast." OST provides scientific guidance and support for a number of California state agencies, including the OPC. USC Sea Grant has partnered with OST on projects in the past and will continue our collaboration to ensure research priorities are being met in the State.

Regional Perspectives

In 2006 the Governor's of California, Oregon and Washington initiated a collaboration to protect and manage ocean and coastal resources by creating the West Coast Governors' Alliance on Ocean Health (WCGA). USC Sea Grant's Director and Associate Director contributed to WCGA's action plans, which focused on: marine debris, climate change, and ocean acidification. Additionally, USC Sea Grant staff participated on WCGA action coordination teams, which focused on specific issue areas. Another regional multi-governmental group, the West Coast Regional Planning Body (RPB), has also worked toward common goals to improve ocean and coastal health. In 2016, a new effort began to build upon lessons learned from the WCGA and RPB. The West Coast Ocean Partnership (WCOP) is a state, tribal and federal body seeking to enhance dialogue and address regional ocean health priorities. The WCOP has identified three regional priorities: Climate Resilient Coastal Communities, Responding to Changing Ocean Conditions, and Improving Ocean Data and Coordination. As the WCOP gains momentum, USC Sea Grant plans to stay actively involved with the WCOP.

Finally, USC Sea Grant's lifelong learning ("K-grey") marine education program works closely with the National Marine Education Association, county school district science specialists and the COSEE Education Foundation, an educational clearinghouse that emerged from the grant program funded through the National Science Foundation (originally Centers for Ocean Science Education Excellence now Consortium for Ocean Engagement and Exploration).



USC Sea Grant hosts an AdaptLA meeting to share new sea level rise models with the community.

A New Lens: Climate Resilience

California has long been a national and international leader in prioritizing research and action on our changing climate. USC Sea Grant will continue to advance scientific understanding of changing ocean conditions and potential impacts to coastal infrastructure and populations and help communities become resilient to storms, sea level rise, shoreline change, and coastal hazards. Additionally, we undertake work not only on the direct effects of changes to the ocean and coasts, but also on the role of climate as a significant driver of changes in ecosystems and habitats. In all of our focus areas, the changing climate will be a lens through which we view the health of coastal ecosystems, the sustainability and resilience of coastal communities and those who work and reside in them, and the production of food resources, both by aquaculture and fishing. In science education, understanding the impacts of a changing climate is already an important dimension affecting all study areas in ocean science.

1 Focus Area: Healthy Coastal Ecosystems



Bioblitz at Pelican Cove MPA.

The region known as the Southern California Bight, stretching from Point Concepción in the north to south of Tijuana, Mexico, is highly developed – an urbanized coast characterized by nearly uninterrupted commercial and residential development. How do we balance ecological conservation and protection with intensive human uses of a public resource? These questions have always been central to USC Sea Grant’s funded research and outreach along the urban ocean coast. We work towards a healthier urban environment, reflected by cleaner coastal waters that afford better opportunities for recreation and commerce, and the protection of human and ecosystem health.

Looking forward, almost all of USC Sea Grant’s research and outreach on healthy coastal ecosystems will have to take into consideration sea level rise and other threats from a changing climate. It is a new lens through which scientists, managers and policymakers must view the future; likewise, it is a lens through which USC Sea Grant will consider and implement future research and outreach. In fact, all the research and outreach areas in which USC Sea Grant works within this focus area – water quality, connections between freshwater and saltwater quantity and balance; harmful algal blooms; ecotoxicology; aquatic invasive species; marine wildlife populations and health; and habitat restoration – will be affected by changing conditions in the coming decades. USC Sea Grant will support focused observations and studies of long-term trends and effects of oceanic events associated with changing climate, such as more frequent or intense storms, warmer waters and sea surface warming, sea level rise, and changes in ocean chemistry, particularly ocean acidification.

It is difficult to tell the story of Los Angeles without talking about water, and it is impossible to tell the story of USC Sea Grant without talking about water quality. Indeed, USC Sea Grant has always maintained a research focus on water quality, and that will not change in the future. Ensuring that coastal waters are safe for people and marine life has always been a priority for the state and particularly for Southern California. However, the nature of water quality work has shifted over the decades from a focus on sewage and associated bacteria to a focus on stormwater runoff and viruses; the focus will continue to shift as the issues of drought, water conservation, and low impact development all effect coastal water quality. For example, as the region implements mandates to conserve and recycle wastewater, pollutant loads increase per unit volume of water and the more concentrated flows that may be even more damaging to both ecosystems and infrastructure. Issues connected to poor water quality from secondary

Key Themes

- Urban impacts on ecosystem health
- Beach erosion
- Harmful algal blooms
- Stormwater and wastewater
- Healthy ecosystems and MPAS
- Aquatic invasive species
- Coastal habitats at the land-sea interface (wetlands, estuaries)

treatment plants as well as stormwater systems, concentrations of pollutants, brine, and toxins continue to impact coastal waters.

USC Sea Grant has and will continue to support research aimed at improving the detection limits, tracking, testing-speed and testing-costs for bacteria, viruses, or other water quality impairments, such as toxins, pharmaceuticals, and marine debris, that may arise in the urban ocean. Southern Californians have long been aware of the connection between inland contamination reaching coastal waters, but new work needs to focus on how the pathways, frequency, and concentration of contaminants may change with the changing climate's predicted effects on drought. In addition, changes in the quantity and quality of fresh water as a result of changing climate may alter the balance and interaction between fresh water inputs and coastal water bodies (i.e. reservoirs, aquifers, ground water and estuaries). It is important to understand these changing hydrodynamics and their impacts on coastal water quality.

USC Sea Grant will continue to fund and manage projects that address ecotoxicological issues in order to determine responses of marine organisms to contaminants and pathogens and to develop effective bio-indicators of contamination. Globally, wildlife and humans are exposed to increasing quantities and types of persistent industrial and pharmaceutical chemical contaminants and the effects of most of these chemicals on marine organisms (or humans) are unknown. A more scientifically-based understanding of the impacts of contaminants of emerging concern could help agencies and managers to develop water quality objectives in a more ecosystem-based manner by linking endocrine



Citizen scientists conduct a bioblitz at Pelican Cove MPA.

disruption and other important health effects directly to the anthropogenic contaminants causing the disruption. Better technology to detect endocrine disruption or other types of physical stress responses may also be able to help visualize the effects of stress caused by environmental conditions such as increasing temperature and ocean acidification, as well as other chemical and physical changes.

Closely linked with pollution and coastal water quality is the growing issue of harmful algal blooms (HABs). Scientists still do not know all of the conditions trigger a toxic algal species to bloom and produce toxin, but USC Sea Grant has and will continue to invest in projects investigating the biology and ecology of these species and the cascading effects of hypoxia, fish kills, and health threats to marine mammals and seafood resources. USC Sea Grant will support research to develop methods to establish indices of toxicity; to acquire predictive understanding of massive algal accumulations; and to understand the impacts of HABs on the complex coastal oceanographic processes and changing ocean temperatures and chemistry. As the balance of interactions between fresh and salt water may shift with a changing climate, it will also be important to examine interactions between fresh water algal blooms and the coastal ocean.

Research is only one piece of the complex HAB-management puzzle. Local informal science centers such as aquaria and museums are often bombarded by questions from the public during visible HAB events, and it is challenging for these institutions to address the complex issues and questions that arise. In response in 2011, USC Sea Grant, in partnership with scientists, informal science centers, and local classrooms, created the community HABWatch program. The program involves students and the general public in data gathering and involves the researchers in workshops and other forms of community education.

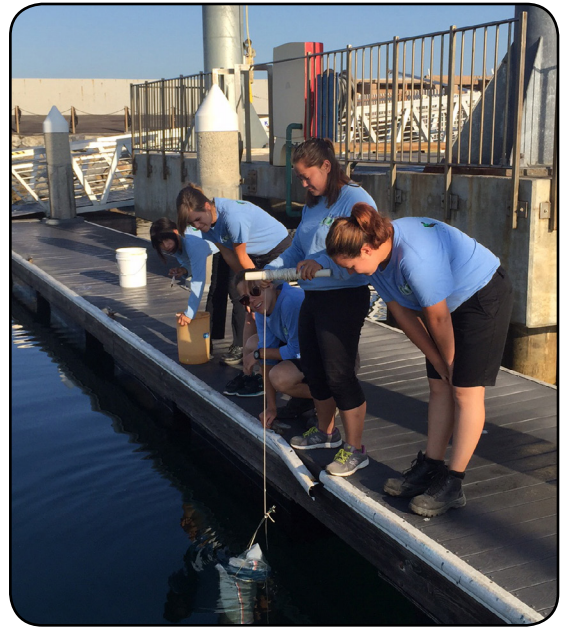
As we move forward with new ways to engage public interest in science and stewardship, USC Sea Grant aims to become a new hub for shared data and information on HABs as well as a variety of other marine and coastal issues. In the near future, more citizen science and stewardship programs will use established and approved scientific protocols to gather data and enter it into databases, making that information easily available to students, scientists, and coastal managers.

In the past, USC Sea Grant has focused on aquatic invasive species (AIS), forming national and international partnerships to study, monitor invasive species, investigate potential pathways of introduction, and, finally, develop policies and tools to prevent the introduction and spread of these organisms. Some scientists predict that the spread of AIS may increase with changing climate - research and outreach investigating new species or new threats to the urban ocean coastal ecosystem caused by invasive species will continue to be important. The development of tools such as AIS field guides is critical to building an effective citizen science community to help early detection of species introduction and ecosystem dynamics.

In 2012, a new network of marine protected areas (MPAs) went into effect along the Southern California coast. MPAs are considered to be an essential part of ecosystem based management regimes, and help to ensure robust habitat quality that is resilient to changing conditions. USC Sea Grant played a large role in the multi-year process to create these MPAs, ensure they were based on the best available science, and ensure that all stakeholders had a voice at the planning table. Adequate monitoring of these MPAs, developing science-based adaptive management methods, and fostering public education will be critical for the future success of these protected areas in a changing climate. USC Sea Grant leads the Los Angeles regional MPA Collaborative, one of a statewide network of groups charged with fostering the State's implementation of education and enforcement programs and developing new outreach designs for the MPA network. Questions about resilience inside and outside of MPAs will be important aspects of MPA assessment, and useful as other jurisdictions around the US consider implementing MPA designs. USC Sea Grant will continue to work diligently with local, regional, state and federal partners to ensure that the purpose of Southern California's MPAs is achieved, and that they are well understood and supported by the public.

In addition to the California network of MPAs, USC Sea Grant works closely with the National Marine Sanctuary Program and other federal entities with jurisdiction over marine protected areas. As a longtime participant on the Channel Islands National Marine Sanctuary Advisory Council, Associate Director Phyllis Grifman works closely with Sanctuary managers and stakeholders to foster public understanding of sanctuaries and MPAs and encourage wise recreational use, and to develop and help integrate research and management plans with other uses of the California offshore region.

Certain coastal habitats at the land-sea interface—estuaries, wetlands, sandy beaches, rocky intertidal—are particularly vulnerable to urbanization, development, sea level rise, and other shoreline changes. Many estuaries and wetlands (and their associated ecosystem services)—once prevalent along the Southern California coast—have been removed or heavily modified by development. According to the California Natural Resources Agency, less than 10% of historical distributions of wetlands remain intact in the State. These habitats are not only important for the organisms which depend on them, but they also provide ecosystem services to humans such as water filtration, physical barriers from storms and flooding, groundwater recharge, and nursery grounds for fisheries of economic importance. With added threats from rising sea levels, these coastal habitats will likely face additional impingement in the future. Understanding how estuaries, wetlands, beaches might change in the future will enable planners to make informed choices for their restoration, management, and sustainable development.



Collecting water samples for HABWatch.



Checking for invasive species.

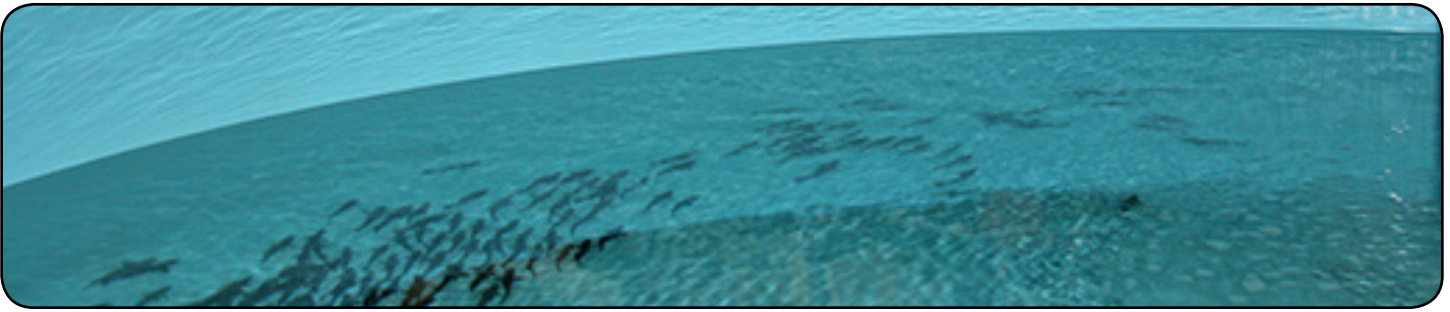
Healthy Coastal Ecosystems Goals and Outcomes (HCE)

HCE GOAL 1: Habitat, ecosystems, and the services they provide are protected, enhanced, or restored.

- **Action 1:** Develop and share scientific understanding, decision-support tools, technologies, and approaches to protect and restore ecosystems.
 - Outcome 1:** Scientific understanding and technological solutions inform and improve the management and conservation of natural resources.
 - Outcome 2:** Ecosystem science and conservation priorities developed through stakeholder participation are addressed.
 - Outcome 3:** Greater awareness and understanding of ecosystem functions and services they provide improves stewardship efforts.
- **Action 2:** Sustain the habitat, the biodiversity and the abundance of coastal ecosystems, fish, wildlife, and plants.
 - Outcome 1:** Biodiversity, habitats, and ecosystem functions and services are restored and sustained.
 - Outcome 2:** Improved collaborative planning and decision-making leads to enhanced stewardship.

HCE GOAL 2: Land, water, and living resources are managed by applying sound science, tools, and services to sustain ecosystems.

- **Action 1:** Support a sound science - and management - driven framework that integrates observations, monitoring, research, and modeling to provide a scientific basis for informed decision-making.
 - Outcome 1:** Collaborations with partners and stakeholders support planning, research and technological solutions to address resource management needs.
 - Outcome 2:** Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities, economies and ecosystems.
 - Outcome 3:** Communities have access to sound science, data, tools, and the training to be effective in planning and decision-making processes.
 - Outcome 4:** Resource managers understand the risks, the options, tradeoffs, and impacts of their decisions.
- **Action 2:** Identify and promote case studies and strategies to enhance resilient ecosystems and watersheds in the context of changing conditions.
 - Outcome 1:** Communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
 - Outcome 2:** Communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.



Juvenile white seabass in an aquaculture tank.

It is USC Sea Grant's vision to have a safe, sustainable seafood supply and a public that understands how to make healthy and sustainable seafood choices. Like much of the world's oceans, Southern California has witnessed a decline in fisheries over the last half century. Threats to fisheries off the Southern California coast include poor water quality; endocrine disruption from chemicals of emerging concern, coastal development and habitat destruction; increased activity of recreational fishing; and added threats from increasing temperatures and ocean acidification. Maintaining infrastructure for sustainable commercial fisheries present port and harbor managers with issues and opportunities for redevelopment of aging coastal assets.

Coastal development has always been an issue for fisheries for as long as USC Sea Grant has been working on the urban ocean coast. Research has shown that many species, including important game fish, use coastal wetlands and lagoons for breeding and nursery grounds. More work is needed to understand how restoration of these sites could benefit fisheries, and how added threats from ocean and a changing climate may affect these coastal fish habitats.

More research is needed to understand how new habitats have become important for fish recruitment and production in Southern California. Oil and gas platforms off the Southern California coast serve as artificial reefs and host a great diversity and abundance of marine life. We need to understand which physical characteristics and environmental conditions around these structures are associated with increased fish production. This work could have significant applications in the design and policy related to the deployment of new man-made structures in the marine environment (e.g., rocky reefs, renewable energy technologies) and in determining the potential biological impacts of platform decommissioning options.

Recreational fishing in particular is of great importance in Southern California. USC Sea Grant will continue to fund research, outreach and education projects focused on recreational fisheries in Southern California, to foster innovative methods for improving game fish survival based on fish biology and ecology, and to foster understanding of California regulations meant to enhance sustainable and robust recreational opportunities.

Sustainable aquaculture is an important societal need that will continue to grow in the future. With collapsing fish stocks and an increasing national demand for seafood, it is clear that natural fish stocks, even with the help of marine protected areas (MPAs), will not be able to sustain fisheries markets. According to NOAA's Office of Aquaculture, 91 percent of seafood consumed in the U.S. is imported (and half of that is from aquaculture), leading to a seafood deficit of over \$11.2 billion per year. Domestic aquaculture will help the U.S. avoid larger foreign imports of seafood.

Key Themes

- Aquaculture and aquaponics in the classroom
- Coastal development and fisheries
- Fish recruitment and production
- Recreational fishing opportunities
- Seafood safety education

It is critical that any coastal or open ocean aquaculture program is conducted sustainably; therefore, soliciting and initiating research on sustainable practices and reducing the potential environmental impacts of aquaculture will be an important consideration moving forward. In addition, research reveals that increasing levels of ocean acidification can significantly impact fish stocks, particularly those with carbonate shells such as shellfish; fisheries research and aquaculture based-studies to investigate ocean acidification threats and possible adaptations will be equally important.

In order to support growing aquaculture and aquaponics industries, a trained workforce must be exposed to the subject in the classroom as well as in the field. High school students, for example, can learn first-hand about fish biology and husbandry, both to restock species and to run effective aquaponics systems. Coordinated research, outreach and education in this area will be important to raise the next generation as informed consumers and a trained workforce.

Finally, seafood safety education will continue to be a priority for USC Sea Grant. Enlightened consumers make wiser choices about buying domestic products rather than imported ones that may not be harvested in sustainable ways. Moreover, those who understand the seafood markets and production practices will be better able to make healthy choices not only about the food they eat, but the manner in which it is produced, harvested, and processed. Consumers are better able to protect their families' health as they learn the safest methods for cooking seafood. Along the diverse and urban coast of the Los Angeles region, there are over 140 spoken languages and many different cultural practices when it comes to catching, preparing and eating seafood. Partnerships are critical in making sure that our education resources can be understood within the context of these various cultures populating the Los Angeles region.



Researchers demonstrate of a non-lethal method for determining the sex of California halibut.
Photo: The Bay Foundation

Sustainable Fisheries and Aquaculture Goals and Outcomes (SFA)

SFA GOAL 1: Fisheries, aquaculture, and other coastal and freshwater natural resources supply food, jobs, and economic and cultural benefits.

- **Action 1:** Develop a trained workforce and enhance technology transfer in domestic aquaculture.
 - Outcome 1:** Increased understanding and technological solutions aid aquaculture management and production.
 - Outcome 2:** Partnerships enable the aquaculture industry to adapt and acquire innovative technologies.
- **Action 2:** Promote and support harvest and processing techniques that lead to safe, sustainable and high-quality food and economic and ecosystem benefits.
 - Outcome 1:** Coastal resource industries employ technologies and reinforce strategies to ensure safe and sustainable seafood and products.
 - Outcome 2:** Consumers understand the health benefits of seafood and purchase safe and sustainable products.
 - Outcome 3:** Coastal resource industries employ strategies that balance economic, community and conservation goals.

SFA GOAL 2: Natural resources are sustained to support fishing communities and industries, including commercial, recreational, and subsistence fisheries, and aquaculture.

- **Action 1:** Ensure sound science, services, and tools are available and accessible to resource managers, the fishing and aquaculture communities and consumers.
 - Outcome 1:** Commercial and recreational fishermen and aquaculturists are knowledgeable about efficient, sustainable, and responsible tools, techniques, and uses of coastal and freshwater resources.
 - Outcome 2:** Resource managers and fishing and aquaculture communities have access to science and tools to increase their capability to adapt to future resource management needs.



Left: Students build and plant an aquaponics tank in their classroom.



Right: Students weigh juvenile white seabass before putting them into an aquaculture tank in their classroom.



King tide at Venice Pier.

California's coastal cities continue to face population growth and associated development pressures, placing demands upon ecosystems, water supplies and other vital resources. To compound the complexities of providing for a vibrant economy while protecting natural resources, Californians have the added challenge of prolonged drought and the imminent impacts of a changing climate. Sea level rise and shoreline change threaten coastal infrastructure, beaches and wetlands, and increased storminess could lead to damaging floods and mudslides. USC Sea Grant's vision is to support a balance between the robust economic opportunities of the coast and ocean and the continued sustainability of marine ecosystems and resources. We will continue to play a major role in helping communities - including decision-makers, teachers and students - understand current climate science and effectively integrate science into planning efforts, reducing risks and increasing resilience to natural and human-induced hazards.

Our goal is to share the best available science information and planning tools and provide technical assistance across Southern California to enable the region to prepare and adapt for a changing change now, thereby limiting future risks and economic losses. USC Sea Grant not only funds research and develops outreach products and educational tools to help understand the impacts of changing coastlines, but also works closely with local, regional and state government to help coastal managers and communities understand and evaluate adaptation strategies to prepare for impacts from a changing climate.

Since 2010, USC Sea Grant's AdaptLA Program has developed and implemented a robust outreach, capacity building and technical assistance program to coastal communities across Southern California. We conducted a statewide longitudinal survey to assess the state of adaptation in California, ensured the best available scientific modeling for sea level rise is available for local jurisdictions, assisted cities and L.A. County to assess vulnerabilities, and have trained thousands of coastal professionals on a variety of adaptation-related topics.

Over the next few years, we will continue to support the needs of the adaptation community of practice in Southern California and expand to new areas of focus. This work includes: supporting research aimed at evaluating the impacts of a changing climate on our coastal resources such as beaches, wetlands, aquifers and rocky intertidal zones; evaluating the effectiveness and economic feasibility of potential adaptation strategies with an emphasis on natural and nature-based solutions, and providing guidance and assisting in monitoring innovative shoreline resilience approaches. For populations affected by potential changes to coastlines, we will assist emergency

Key Themes

- Sea level rise and shoreline change
- Integrate science into planning efforts
- Scientific technical assistance
- Community outreach and engagement
- Partnerships and regional coalitions among governments, communities, and jurisdictions
- Nature-based solutions
- Maritime commerce and security
- Port development, air quality concerns, operational efficiency, and alternative fuels

managers and planners in integrating changing climate considerations into disaster and land use planning and engage communities in discussion of social vulnerability and potential opportunities to build community resilience. Finally, we continue to serve as a collaborator and convener for scientists and groups developing a watershed-level hydrological community of practice that includes all actors that manage and regulate local water resources.

In addition to being the largest urban center on the West Coast and the second largest in the nation, Los Angeles County is home to the ports of Los Angeles and Long Beach, constituting the busiest seaport complex in the country. Close to 45% of all marine freight entering the U.S. comes through these ports and international trade brings considerable economic benefits to the region as well as the nation. However, there are also notable environmental impacts on the coast and residents in the region, such as poor air quality, diminished water quality, and transportation congestion.



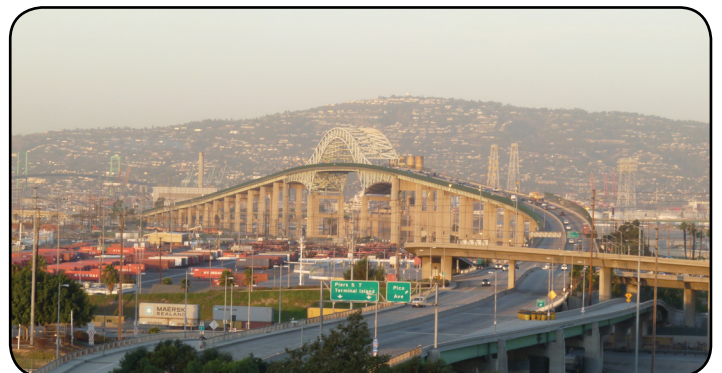
King tide in San Diego.

Looking ahead to 2021, we estimate there will be increases in maritime commerce that will impact the two Southern California ports, as well as the potential for emerging cyber risks to maritime transportation systems. Alterations in shipping patterns due to the new Panama Canal is an issue of importance to commerce in Southern California, along with potential changes due to changes in sea ice in polar regions. Both will have international ramifications and we anticipate being in a position to convene multidisciplinary discussions on the associated issues.

Finally, potential changes in energy resources, both offshore and nearshore, are issues of interest to national constituencies; for example, discussion of an energy island in the Port of Long Beach is beginning to take place. Sea Grant will follow these emerging issues, and is prepared to facilitate discussions.

USC Sea Grant's long-standing relationships with coastal communities and industries make it ideally suited to provide expert advice in port planning in conjunction with environmental management and protection and emerging issues. We will continue work to support analysis of development plans for a major marine laboratory and outreach center on the waterfront in the Port of Los Angeles; to provide widely available public education on the balance between economic development of seaports and environmental protection; to provide accurate scientific information to reduce conflicts over proposed multiple uses of coastal spaces; and to increase efficient land use practices. In addition, USC Sea Grant conducts research on the operational efficiency of seaports and the use of alternative maritime fuels.

Sustainable land use practices have significant effects on water quality in urban watersheds and along the coast. In addition to research and outreach on water quality issues in the nearshore ocean (addressed in the Healthy Coastal Ecosystems Focus Area) USC Sea Grant works with managers and stakeholders to ensure improved understanding of how land-use practices and coastal policy intersect.



Port of Long Beach.

In coastal communities, new paradigms for sustaining resilient communities are being developed using information from economics, planning, landscape architecture, and the building industry. Low impact development is one tool being deployed to minimize runoff and conserve water, especially important in drought-prone Southern California. As coastal communities transform from fishing communities to combined residential, business and recreation centers, questions about size, scale, and open space puzzle planners and stakeholders alike. USC Sea Grant contributes to the development of tools for including multiple voices in the development of coastal and marine spatial planning.

Resilient Communities and Economies Goals and Outcomes (RCE)

RCE GOAL 1: Coastal communities use their knowledge of changing conditions and risks to become resilient to extreme events, economic disruptions, and other threats to community well-being.

- **Action 1:** Use innovative tools to increase the public's awareness of changing conditions and the potential impacts their communities, economies and ecosystems may encounter.
 - Outcome 1:** Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their communities, and are prepared to respond, and adapt.
 - Outcome 2:** Existing and innovative training programs improve community leaders' understanding of changing conditions in their communities and implement adaptive strategies.
- **Action 2:** Utilize comprehensive planning and adaptive management strategies to enhance community resilience and adapt to hazards and changing environmental and socioeconomic conditions.
 - Outcome 1:** Communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
 - Outcome 2:** Communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- **Action 3:** Increase the resilience of coastal communities through diversification, growth, and strengthening of coastal economic sectors.
 - Outcome 1:** Members of the community, including the underserved, have access to information needed to understand how coastal economic activities and trends will impact environmental and community well-being.
 - Outcome 2:** Communities have access to tools, services, and technologies to adapt and grow resilient economies.
 - Outcome 3:** Leaders in coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem resources and the services they provide.

RCE GOAL 2: Water resources are sustained and protected to meet existing and emerging needs of the communities, economies, and ecosystems that depend on them.

- **Action 1:** Inform community members about how actions impact water quality and availability.
 - Outcome 1:** Community members understand watershed functions and the services they provide that support communities and economies.
 - Outcome 2:** Community members understand how actions will impact water quality and quantity and are able to make informed decisions.

- **Action 2:** Collaborate with stakeholders to develop and share best management practices (BMPs) and measures to protect and manage water resources.
 - Outcome 1:** Communities have access to sound science, data, tools, and services to understand and anticipate changes in water quality and quantity.
 - Outcome 2:** Communities have diverse, sustainable economies and industries that support the existing and emerging water resource needs.
 - Outcome 3:** Communities have access to science, tools, and technologies to protect and sustain water resources and make informed decisions.



Sharing coastal hazard maps during an AdaptLA meeting.



Los Angeles Coastal California Naturalists.

USC Sea Grant strengthens urban communities' connection with the ocean and coast through a suite of education initiatives. The broad range of programs, curricula and place-based learning reaches underserved youth, educators, families and life-long learners across Southern California. Where connections are made, learning takes place - across many environments, bridging generations and resource gaps. Ocean science education is not always available to students; and USC Sea Grant strives to provide access for under-represented groups, and early opportunities for exposure to climate and ocean concepts in science, technology, engineering, and math (STEM) fields, so students can develop their own ocean related experiences. Students' interest in STEM careers is often sparked when they meet environmental and ocean scientists, learn about career opportunities in these fields and learn to apply science practices themselves.

Ocean literacy is critical for individuals so that they can make informed and responsible decisions regarding the ocean and its resources. USC Sea Grant is a well-established educational resource, providing the scientific and technical information to inform the development of classroom curricula and informal education programs (e.g., through aquaria, science centers, museums). USC Sea Grant will continue its work connecting ocean science and policy to on-the-ground formal and informal education, making sure that all people in Southern California, particularly all students, have exposure to environmental science, career opportunities, and the ocean itself.

Additionally, educators must be supported to develop creative methods that ensure not just learning, but application of knowledge for all audiences. Helping learners to develop the critical thinking skills to make wise decisions and to engage as citizen volunteers for meaningful stewardship experiences is essential to achieving ocean literacy. USC Sea Grant supports the application of science and engineering practices and creates linkages among researchers and graduate students with formal and informal educators to foster use of real scientific data as an educational tool.

USC Sea Grant approaches this through professional development and partnerships and this approach enables teachers to create and implement standards-based marine science lessons that interweave ocean literacy principles and concepts; and to develop marine and aquatic science education and ocean literacy strategies as a prominent part of the state, regional, and national education agendas. USC Sea Grant is a leader in the national effort to develop principles, scope and sequence for ocean literacy.

Key Themes

- Place-based learning
- Intergenerational learning
- Community-based science programs
- Professional development for educators
- Next Generation Science Standards
- Bridging formal and informal education
- Meaningful stewardship experiences
- Diverse cultural connections to the ocean
- Undergraduate and graduate training

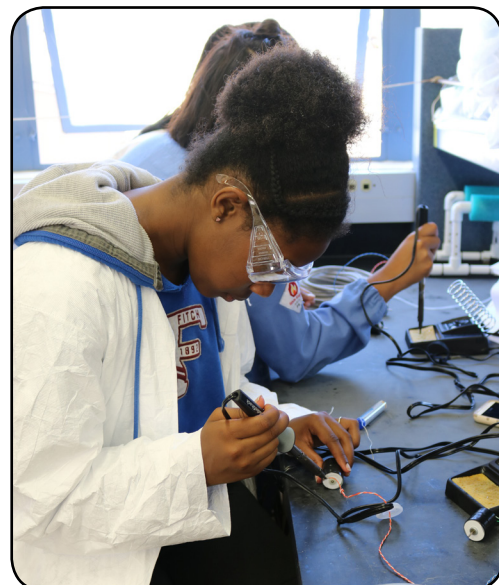
Updated ocean and climate literacy concepts and principles correlate well with the Next Generation Science Standards adopted by the State of California.

USC Sea Grant's education programs go beyond formal educational settings and curricula to make current marine science available and local scientific experts accessible to all people in the Los Angeles region, regardless of age, primary language, or prior educational experience. It is important to provide a variety of methods to informal educators to help the public understand coastal and ocean science—including its applications—to help foster a sense of stewardship in our society. This is especially important in developing life-long learning habits and we have strong partnerships with informal science, technology, engineering, and math centers such as aquaria, museums, libraries and afterschool programs to help achieve this goal.

A key to public environmental education is enabling cross-generational learning and building connections among educators, children, and parents. It is important to recognize and value the diverse cultural connections to the ocean among the many unique voices and communities represented throughout the greater Los Angeles area. These voices are essential in broadening our understanding of the historical connections to the ocean and everyone benefits from the shared traditional knowledge and approaches to learning.

Building on our role in public education, USC Sea Grant fosters community based science, or citizen science, programs that enrich data gathering and strengthen relationships between researchers and the public. These types of projects bring together scientists and community members to create opportunities for dialogue and new perspectives around some of our most pressing ocean and coastal issues. USC Sea Grant has helped fund, organize, and lead a number of community-based science projects in the last five years, and so far these relationships seem to be quite symbiotic; scientists are benefitting from the expanded scope of data coming in from the public, and the public is benefitting from early understanding and support of these ongoing projects. This will continue to be an area of growth for USC Sea Grant in the coming years. Experiences in community based science programs lead to greater science literacy, engagement in local issues and, in some cases, pursuing careers in ocean science and policy.

Ocean science education is an investment in the future of healthy coastal ecosystems and resilient communities and economies. Our undergraduate teaching, graduate research investment, and fellowship opportunities help students prepare for careers in science, technology, engineering, mathematics, and other disciplines critical to local, regional and national needs. Traineeships help train graduate students at both Master and Doctoral levels for careers in academia, government and private enterprise, and fellowships (Knauss especially) place the very best graduates in positions that prepare our students to lead the nation in sustainable and forward thinking environmental management.



Summer High School Marine Lab.



Teacher workshop on sea level rise.



Urban Tides beach walk.

Environmental Literacy and Workforce Development Goals and Outcomes (ELWD)

ELWD GOAL 1: An environmentally literate public that is informed by lifelong formal and informal opportunities that reflect the range of diversity of the Nation's coastal communities.

- **Action 1:** Enable the public to engage in community planning processes with respect to adaptive management to changing conditions by providing the best available information.

Outcome 1: Communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes.

- **Action 2:** Increase effective environmental literacy instruction for K-12 students by formal and informal educators.

Outcome 1: Teachers and students are better informed in science, technology, engineering, and mathematics fields and can employ their knowledge to support sustainable practices within their communities.

- **Action 3:** Increase effective environmental literacy communication to stakeholders, including how ecosystem change affects economic, social, and cultural values, as well as implications for conservation and management.

Outcome 1: Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal, and marine ecosystems and resources.

Outcome 2: Communities implement sustainable strategies when managing natural resources and make decisions based on information acquired through informal science education.

ELWD GOAL 2: A diverse and skilled workforce is engaged and enabled to address critical local, regional, and national needs.

- **Action 1:** Grow awareness among the nation's diverse population of career paths that support the needs of the nation's coastal communities.

Outcome 1: All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the nation's coastal communities, economies, and ecosystems.

- **Action 2:** Increase opportunities for undergraduate and graduate students to gain knowledge and experience in the science and management of watershed, coastal, and marine resources.

Outcome 1: College level courses and internships provide increased literacy, experience, and preparedness in areas of watershed, coastal, and marine ecosystems for all students including those from underrepresented groups.

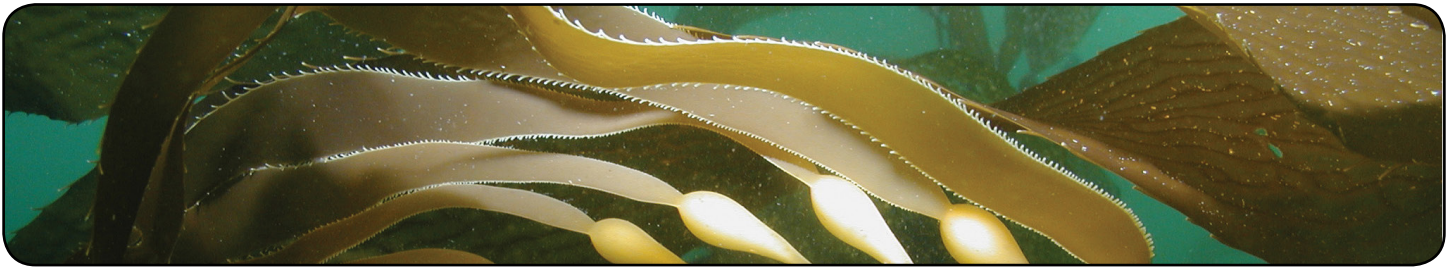
Outcome 2: Undergraduate and graduate students including those from underrepresented groups, are supported and have access to formal and experiential learning, training, and research experiences.

- **Action 3:** Prepare a responsive and diverse workforce to advance and benefit from sectors that support the needs of the nation's coastal communities and ecosystems (e.g. industry, research, government, etc.), and to adapt and thrive in changing conditions.

Outcome 1: Employment in all sectors of the U.S. coastal resource enterprise expands and diversifies.

Outcome 2: The existing and future workforce is able to adapt and thrive in changing environmental, social, and economic conditions.

USC Sea Grant: Who We Are



Giant kelp.

Director, Linda E. Duguay, Ph.D.

In addition to serving as the Sea Grant Director, Dr. Duguay also serves as the Director of Research for the Wrigley Institute for Environmental Studies and is a Research Associate Professor in the Marine Environmental Biology section of the Department of Biological Sciences. This enables a close connection with research scientists and teaching programs at graduate and undergraduate levels. She also serves on USC's Women in Science and Engineering (WISE) advisory board and on the USC's Provost's Strategic Planning Committee. She is a Board member of the recently formed international Consortium for Ocean Science Exploration and Engagement (COSEE), a nonprofit foundation built upon the former NSF-funded COSEE program, composed of "ocean scientists and educators working together to transform ocean science education." Linda is the current President of the Association for the Sciences of Limnology and Oceanography (ASLO) (current term 2016-2018; she will serve as past President 2018-2020), in addition to serving on several state, regional, and national boards. Her work nationally helps to link USC marine programs with respected scientists around the U.S. and the world. Through her leadership and service, Linda ensures that USC Sea Grant remains at the advancing edge of ocean science and the emergence of new issues and innovations in science and education.

Associate Director, Phyllis Grifman, M.A.

As Associate Director, Ms. Grifman serves as Research Coordinator and oversees extension, outreach and education programs. She is an active partner in numerous state and national activities, linking Sea Grant with research and information networks in such areas as national marine sanctuaries, state marine protected areas, ecosystem science, land use planning in both the public and non-profit sectors, and other local, regional and national endeavors. Ms. Grifman maintains close contact with current and former Sea Grant scientists, and develops Sea Grant's new research capabilities. She has served as Vice Chair of the Advisory Council of the Channel Islands National Marine Sanctuary for the past four years, and has served on the Council for over a decade.

Marine Transportation & Seaport Specialist, Director of Extension, James Fawcett, Ph.D.

Dr. Fawcett is an Adjunct Associate Professor in both the Dornsife College (Environmental Studies Program) and the Sol Price School of Public Policy, teaching marine environmental policy and coastal management. He is a well-known national and international expert in ports and maritime transportation, and serves as a liaison with the Ports of Long Beach and Los Angeles, the L.A. business community, and key Asian seaport researchers and managers. An urbanist by training, he focuses on the environmental impacts of the marine transportation industry and the decision regimes by which public goods are managed. He serves on the Marine Conservation Research Institute Board of Directors at the Long Beach Aquarium of the Pacific (AoP), extending his expertise through public lectures and advice on public projects.

Education Programs Manager, Linda Chilton, M.A.

Ms. Chilton is responsible for developing, implementing, and coordinating a broad range of educational programs for students, teachers and families. Through her long participation in COSEE (now the COSEE Education Foundation), and numerous collaborations with science educators throughout California, she brings together scientists and educators to develop curriculum and field programs on current marine science topics. Ms. Chilton leads the development of the region-wide HAB (Harmful Algal Bloom) Watch Program, a citizen science initiative, and works with educators along the West Coast to reduce the introduction of aquatic

invasive species. She manages USC Sea Grant's Island Explorers and Parent Child Education Programs, and leads a High School Marine Lab Summer Science Program at the Wrigley Marine Science Center (WMSC) on Catalina Island. Ms. Chilton dedicates much of her time engaging lifelong learners in citizen science, connecting informal science experiences with current research and ocean issues, and creating partnerships to support underrepresented audiences in marine science education and career development. In 2014, she received the prestigious Marine Educators Award from the National Marine Educators Association, recognizing more than 25 years of leadership in marine science education.

Research, Policy and Planning Specialist, Alyssa Newton Mann, M.P.A.

Ms. Newton Mann's work focuses on planning for climate change impacts and building disaster resilience. Her background is in emergency management and international affairs, having worked at multiple federal and state government agencies, including FEMA, the U.S. Department of State and the State of California. Ms. Newton Mann applies her expertise on disaster planning and social vulnerability across several projects at USC Sea Grant. She was one of the lead authors for the Sea Level Rise Vulnerability Study for the City of Los Angeles, manages the program's climate change adaptation projects, including the county-wide Regional AdaptLA project, and serves on a number of regional, state and national network organizations aimed at sharing lessons and developing collaborative approaches to addressing climate risk.

Science, Research and Policy Specialist, Nick Sadrpour, M.S

Mr. Sadrpour joined the USC Sea Grant team in November 2016 and focuses on connecting USC Sea Grant funded research and projects with managers, planners and community members in Southern California. His broad scientific background covers a spectrum of topics from water quality to coastal erosion. Previously he served as a California Sea Grant Fellow with the Ocean Protection Council, fostering relationships among scientists, stakeholders, and decision makers. Mr. Sadrpour strives to promote existing USC Sea Grant programs as well as to develop new initiatives through collaborative efforts.

Communications Manager, Holly Rindge, M.A.S.

Ms. Rindge develops communication strategies and materials, and coordinates USC Sea Grant communication efforts across projects, programs, and digital media platforms. She joined the Sea Grant team in November 2014 with a strong background in the interplay between marine science, policy, and communications. Ms. Rindge works to raise the visibility of the USC Sea Grant Program among key stakeholders by integrating diverse communication activities with program management, research, extension, and education initiatives.

Science Writer, Charlotte Stevenson, M.S.

Ms. Stevenson writes USC Sea Grant's science journal, The Urban Mariner, and contributes to writing and design of other ongoing USC Sea Grant projects such as website copy, articles, grant reporting and strategic planning. She is the lead author of the recent publication celebrating the past 40 years of USC Sea Grant, 40 Years of Progress in the Urban Ocean.

Contracts and Grant Coordinator, Ruth Dudas

Ms. Dudas has more than 25 years of administrative experience, working in the fields of printing and logistics as Executive Assistant and Office Manager before her tenure at USC Sea Grant. Since 2002, Ms. Dudas has served as USC Sea Grant's fiscal officer and budget coordinator, in addition to providing administrative support for Sea Grant staff. She insures the efficient execution of daily office procedures and serves as liaison with USC contracts and grants operations and sponsored project administration.



Summer High School Marine Lab on Catalina Island.

Appendix I: USC Sea Grant Advisory Council

Name	Affiliation
Dr. Ralph Appy	Port of Los Angeles (Retired)
Brian Baird	Director, Coast and Ocean Program at the Bay Institute, Aquarium of the Bay; Former CA Assistant Secretary for Ocean Policy
Dr. Hee Seok Bang	College of Social Science, Chung Ang University
Dr. Ann Bull	Bureau of Ocean Energy Management
Melinda Bartlett	Dept. of Environmental Affairs, City of Los Angeles
Dr. John Dorsey	Dept. of Natural Science, Loyola Marymount
Dr. Lesley Ewing	California Coastal Commission
Russell Galipeau	Superintendent, Channel Islands National Park
Dr. Mark Gold, D.	Env. Associate Director, UCLA Institute of the Environment and Sustainability
Dr. Mark Helvey	NOAA National Marine Fisheries Service, Southwest Regional Office
Dr. Robert Kanter	Port of Long Beach
Dr. Charles D. Kopczak	California Science Center
Dr. Kuang Lin	Founder and Managing Director, Pacific Star Group
Michael Lyons	Regional Water Quality Control Board
CAPT J. Kipling Louttit	Executive Director, Marine Exchange of So. California
CAPT Richard B. McKenna	Executive Director, International Seafarers Center
Chris Mobley	Superintendent, Channel Islands National Marine Sanctuary; USCB, Ocean Science Education
Craig A. Moyer	Manatt, Phelps & Phillips, LLP
Dr. Mariela Paz Carpio-Obeso	Ocean Unit, Division of Water Quality, State Water Resources Control Board
Dr. Jerry Schubel	Director, Aquarium of the Pacific
Sarah Abramson Sikich	Vice President, Heal the Bay
Rebecca Smyth	West Coast Regional Director, NOAA Office for Coastal Management
Dr. Guang-Yu Wang	Santa Monica Bay Restoration Commission
Dr. Stephen Weisberg	Director, Southern California Coastal Water Research Project

Appendix II: USC Sea Grant Academic Coordinators

Name	Affiliation
Dr. Hilda Blanco	Professor, Interim Director, Center for Sustainable Cities, USC School of Policy, Planning and Development
Dr. Karla Heidelberg	Associate Professor, USC Biological Sciences and Environmental Studies, Director of USC Environmental Studies Program
Dr. Kenneth Nealson	Professor, Wrigley Chair in Environmental Studies, USC Dana and David Dorsline College of Letters, Arts and Sciences, Department of Earth Sciences
Dr. Rick Pieper	Professor, Biology Department, California State University Long Beach, Former Director Southern California Marine Institute
Dr. Patrick Lynett	Professor, USC Department of Civil and Environmental Engineering

Appendix III: Resources Agency Sea Grant Advisory Panel (RASGAP)

Name	Affiliation
Deanna Spehn	39th State Senate District, California
Dr. Ron Flick	California Dept. of Boating and Waterways
Deborah Orrill	California Dept. of Conservation
Debbie Aseltine-Neilson	California Dept. of Fish and Game
Susan Hansch	California Coastal Commission
Don Disraeli	Kanaloa Seafood
Peter Struffenegger	Sterling Caviar LLC
Dirk Rosen	Marine Applied Research & Exploration
Dr. Fred Conte	UC Davis, Bodega Marine Laboratory, Departments of Environmental Toxicology and Nutrition
Marina Brand	California State Lands Commission
Dr. Steven Murray	Interim Provost and Vice President for Academic Affairs and Professor of Biology Emeritus, CSU Fullerton
Dr. James Moffett	USC, Department of Biological Sciences
Deborah Orrill	Marine and Environmental Biology Section
Margy Gassel	Office of Environmental Health Hazard Assessment
Dr. Mariela Paz Carpio-Obeso	Ocean Unit, Division of Water Quality, State Water Resources Control Board



The Urban Ocean Program

**University of Southern California Sea Grant
Strategic Plan
2018 - 2021**

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